

# NASA TECH BRIEF

*Lyndon B. Johnson Space Center*



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## 100-Ampere-Hour NiCd Battery System

A new 100-ampere-hour NiCd battery system has been developed for an orbiting space station. The system can also be used on Earth to start engines and turbines, to provide emergency power, and to furnish mobile energy. It includes four sealed battery cells, each cell providing 1.56 volts. The cells have a minimum operating life of 17,000 hours with a maximum of approximately 48,000 hours. The station orbiting cycle is 96 minutes during which time the cells are discharged for 36 minutes and charged for 60 minutes.

The cells, using potassium hydroxide electrolyte mixed with distilled water, are hermetically sealed in stainless-steel casings. The casings are capable of sustaining material pressures of  $1.6 \times 10^6$  N/m<sup>2</sup> (225 psia) at a temperature of 63° C (145° F) for 30 minutes. Ceramic is used to insulate the positive and negative terminals from the casings. Cell efficiency varies with temperature from 92 percent at -7° C (20° F) to 65 percent at 50° C (120° F). Normal operation is maintained between temperatures of 0° and 20° C (32° and 68° F).

The system includes a special mounting frame designed to support the cells. The frame is an aluminum structure 76 cm (30 in.) long and 9 cm (3.5 in.) wide. It contains special cavities to convey cooling fluids for the cells. The cells are lined up lengthwise for maximum exposure to the cooling fluids.

Optimum cell performance is obtained using a special volumetric electrolyte filling technique. The technique involves filling each cell with nitrogen gas and measuring the resulting pressure change. Based on these measurements, proper electrolyte weight to cell core weight is established. The results are used in determining an optimum volume of electrolyte for each cell.

Performance of the cells is measured with a new tester unit. The unit, operating in conjunction with a power supply, automatically cycles the cells. This

multilevel constant-current charge controller senses battery voltage and drops to the next lower charge-current level when the preset voltage is reached.

### Notes:

1. The reports describing this study are as follows:
  - a. Final Report for 100 Ampere-Hour Nickel Cadmium Battery Development Program  
NASA CR-140380 (N75-14266) Vol. I  
NASA CR-140381 (N75-14267) Vol. II
  - b. Engineering Report for Design and Test of a 100 Ampere-Hour Nickel Cadmium Battery Module  
NASA CR-141600 (N75-16974)

Copies of these reports may be obtained at cost from:

Technology Application Center  
University of New Mexico  
Albuquerque, New Mexico 87131  
Telephone: 505-277-3622  
Reference: B75-10233

2. Specific technical questions may be directed to:  
Technology Utilization Officer  
Johnson Space Center  
Code AT3  
Houston, Texas 77058  
Reference: B75-10233

### Patent status:

NASA has decided not to apply for a patent.

Source: Grumman Aerospace Corp.  
(MSC-14774)

Categories: 01 (Electronics - Components and Circuitry)  
02 (Electronics Systems)  
04 (Materials)  
08 (Fabrication Technology)